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**V-52 KLYSTRON OSCILLATOR
REFINEMENT AND PRODUCTION PROGRAM**

Progress Report for
January 1954



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VARIAN ASSOCIATES
611 Hansen Way, Palo Alto, California



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Engineering Report
No. 132-19

Copy No. 3

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V-52 KLYSTRON OSCILLATOR
REFINEMENT AND PRODUCTION PROGRAM

Progress Report for
January 1954

Prepared for: Bureau of Ships
Navy Department

On: BuShips Contract No. NObs-5358

By: Claude Conner and David Clifford

Approved:


Emmett G. Cameron
Chief Product Engineer

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PURPOSE

The purpose of the program covered by BuShips Contract No. NObs-5358 is to refine and produce one thousand (1000) rugged X-band local oscillator V-52 klystrons. This tube is to comply with the specifications of SHIPS E-720, which were subsequently modified at a conference held at the Bureau of Ordnance, Washington, D.C. on 20-21 May 1952 and later at a conference held at Varian Associates on 29-30 September 1952.

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PROGRESS

During January five more V-52 tubes incorporating the short moly drift tube drawn from sheet stock¹ were constructed. Four of these tubes were tested; one tube developed a leak at the window and had to be discarded. The four tubes tested showed favorable results, having r-f characteristics comparable to those of the standard V-52 (made with the long, drawn moly drift tube). Frequency-temperature drift data were very satisfactory, with the tubes being within specifications and only slightly overcompensated. These results prove conclusively that good drift compensation can be obtained with the short, drawn moly drift tube.

The synthetic mica mentioned in last month's report as a replacement for the present mica window was tested in January. Windows with this material were brazed into dummy bodies and then leak tested. All windows were found to have leaks. Samples of the mica itself were then tested, and all were found to be porous. The supplier has been advised of our findings and tests have been discontinued pending availability of nonporous material. Investigation, however, will continue in order to develop improved window manufacturing techniques.

A post-assembly machining operation was eliminated this month on an experimental group of tubes using pre-cut grids at the interaction gap end of the drift tube. These grids formerly had been brazed to the drift tube and then trimmed to size. With the pre-cut grids the trimming operation becomes unnecessary. Test results will be available during the period of the next report.

Because of high losses encountered in grid mounting operations, a process mentioned in a previous report² is again being investigated. This process involves accurately silver plating the previously copper-plated drift

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1 Varian Engineering Report No. 132-18

2 Varian Engineering Report No. 132-11

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tube assembly. Subsequent firing with grids in position causes a silver-copper alloy to form, which bonds the grids to the assembly. Grids so mounted have been incorporated in tubes, but the tubes have not yet been tested. It is believed that this technique, which eliminates the use of brazing rings previously used for mounting the grids, will reduce grid loss and speed up production.

Emission troubles experienced last month seem to be clearing up, although test results have not indicated a clear-cut cause. Studies into the problem will cease if the present trend continues.

Investigations are being made to determine an improved configuration for the reflector stem cup. It is believed that the force produced by expansion of the silastic molding on the cup can be effectively reduced by a new cup design³.

Performance data of tubes tested in January are given in Table I.

TABLE I
AVERAGE PERFORMANCE DATA OF TUBES TESTED IN JANUARY

	<u>Beam Voltage = 350 v</u>		<u>Beam Voltage = 300 v</u>	
Frequency (mc)	8800	9600	8800	9600
Beam Current (ma)	49.59 (27)	49.44 (27)	40.37 (86)	40.35 (86)
Reflector Voltage (v)	-103.33 (27)	-145.52 (27)	-60.86 (86)	-90.41 (86)
Power Output (mw)	117.70 (27)	125.70 (27)	56.74 (86)	68.09 (86)
Bandwidth (mc)	57.28 (25)	33.33 (27)	74.58 (86)	43.27 (86)
Mod. Sens. (mc/v)	2.34 (25)	1.27 (26)	4.21 (86)	2.40 (85)
Drift, 10 minutes (mc)	+2.91 (5)	-3.65 (15)	-0.08 (28)	-2.15 (48)

The number in parenthesis indicates the number of tubes tested.

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3 Varian Engineering Report No. 132-17

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Regarding the status of V-52 production equipment, work was completed this month on the installation of all items of plating equipment, and very satisfactory operation of this equipment is now being obtained.

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PROGRAM FOR NEXT INTERVAL

Improved techniques for window sealing will be investigated.

The new grid mounting techniques will be evaluated in the light of test results obtained from tubes incorporating these methods of manufacture.

Investigations into a new design for the reflector stem cup will continue.

Estimated expenditures during January 1954: \$34,436.00

Estimated man-hours during January 1954: 2844

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